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(54) Lock

(57) A fastening is provided for use in security arrangements comprising a housing body (16) mountable in working relationship with the keeper plate (18). The body houses a bolt (17) movable into a position in which it engages with an aperture (28) in the keeper plate, and has remote control means at a location (13). Means are provided to indicate at the remote location, when the bolt is in its fastening position. The bolt is moved to its locking position by operation of a

solenoid (29) energised by a wired or wireless connection. In addition a mechanical linkage (14) is provided enabling an operator at the remote location (13) to override the electrical operation of the system.

Microswitches (35) are actuated by a pin carried by push-rod (30) to indicate the state of the bolt. Other microswitches (39, 42) connected to alarms are sensitive to attempts to prise the housing away from the wall and to remove the cover (16) respectively. In addition, seal (44) prevents attack on the bolt by chemicals.

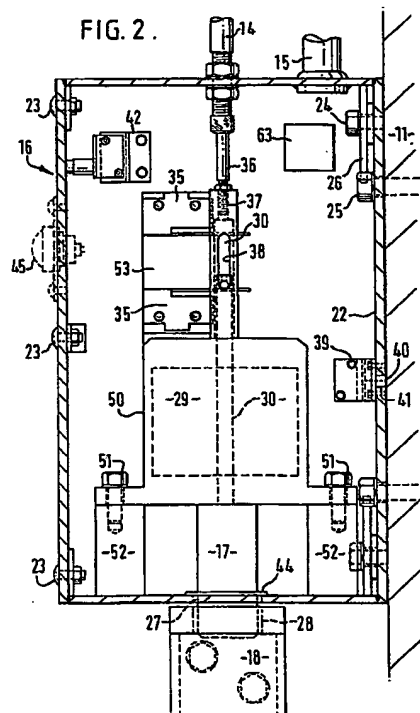


FIG. 1.

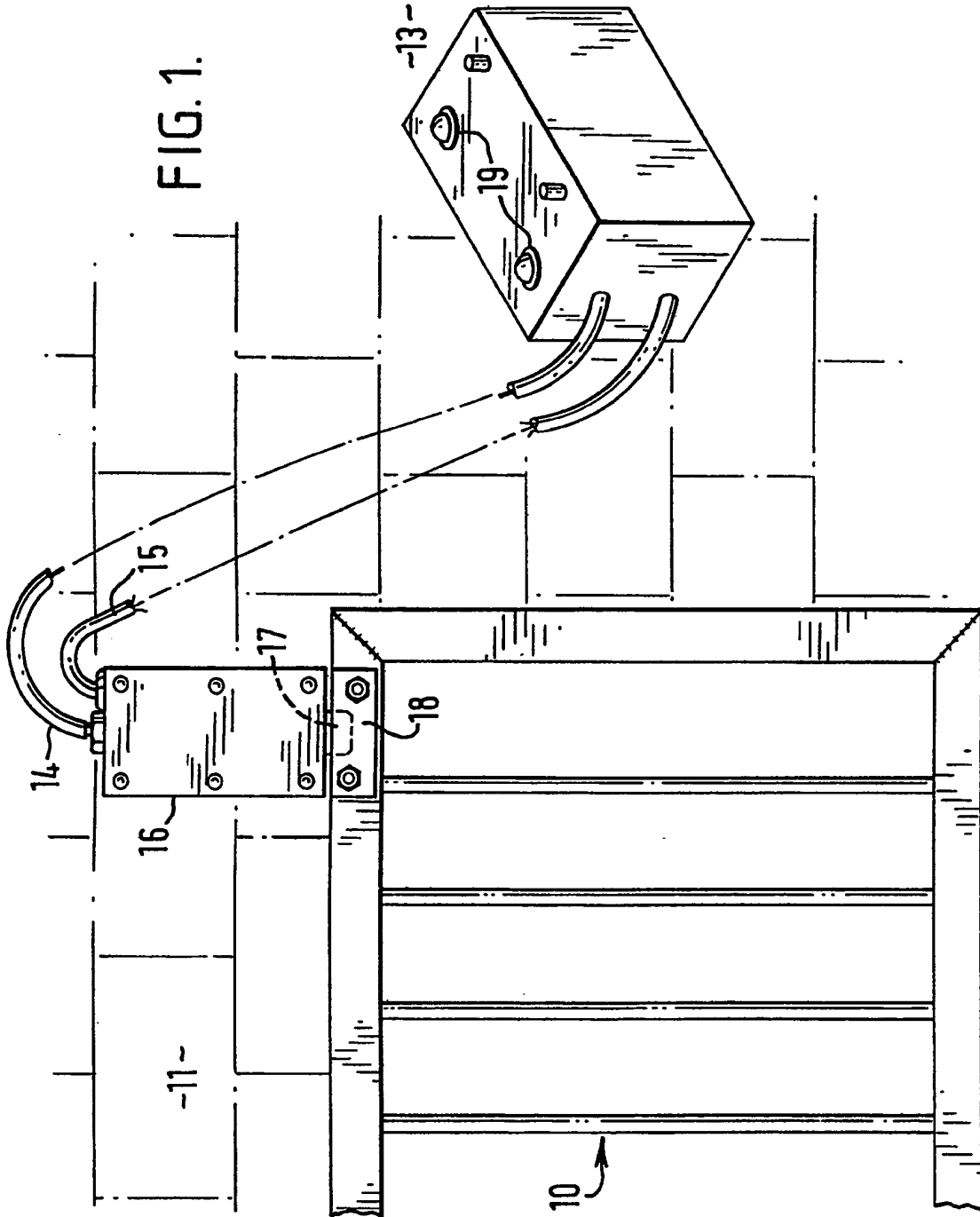
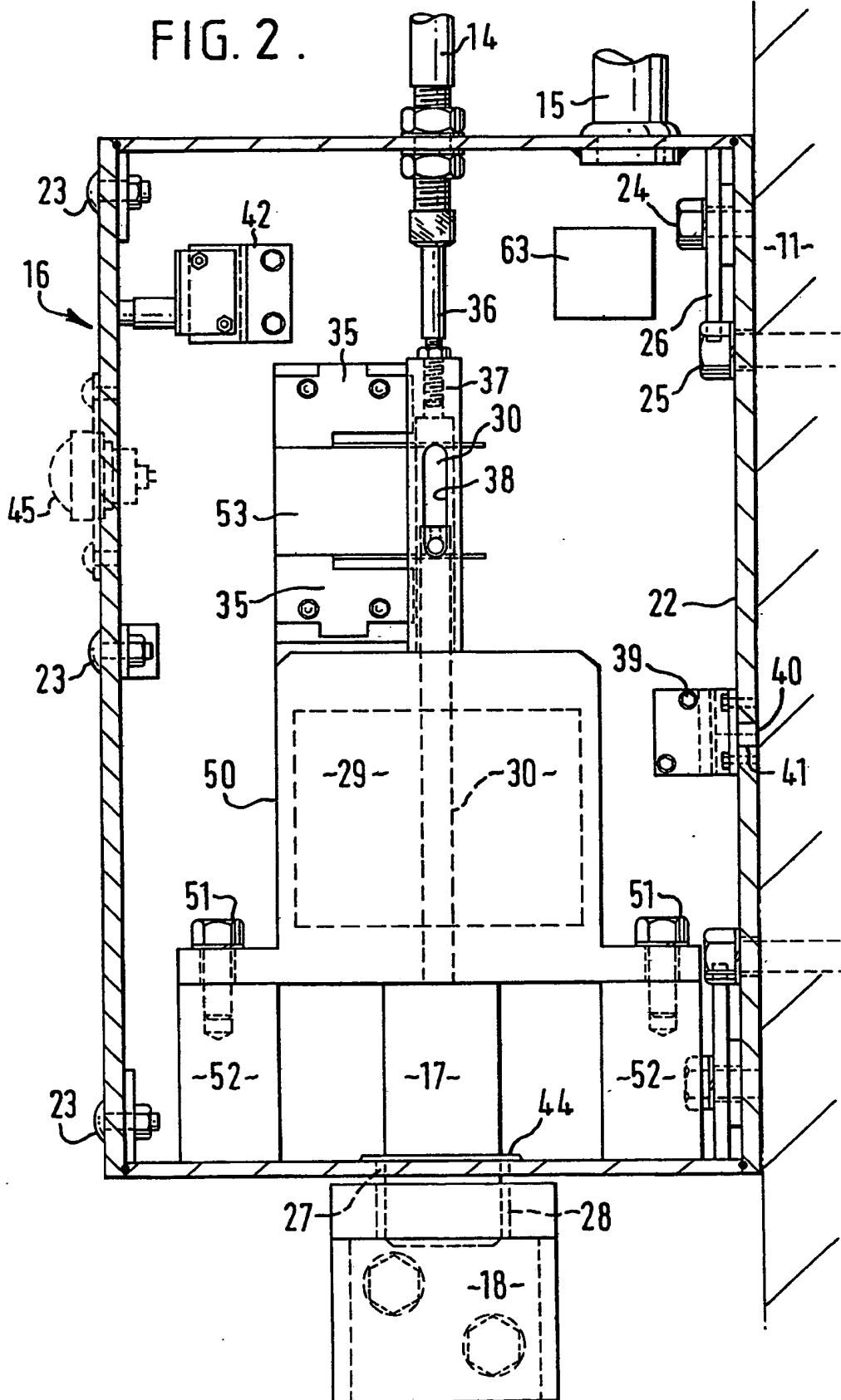
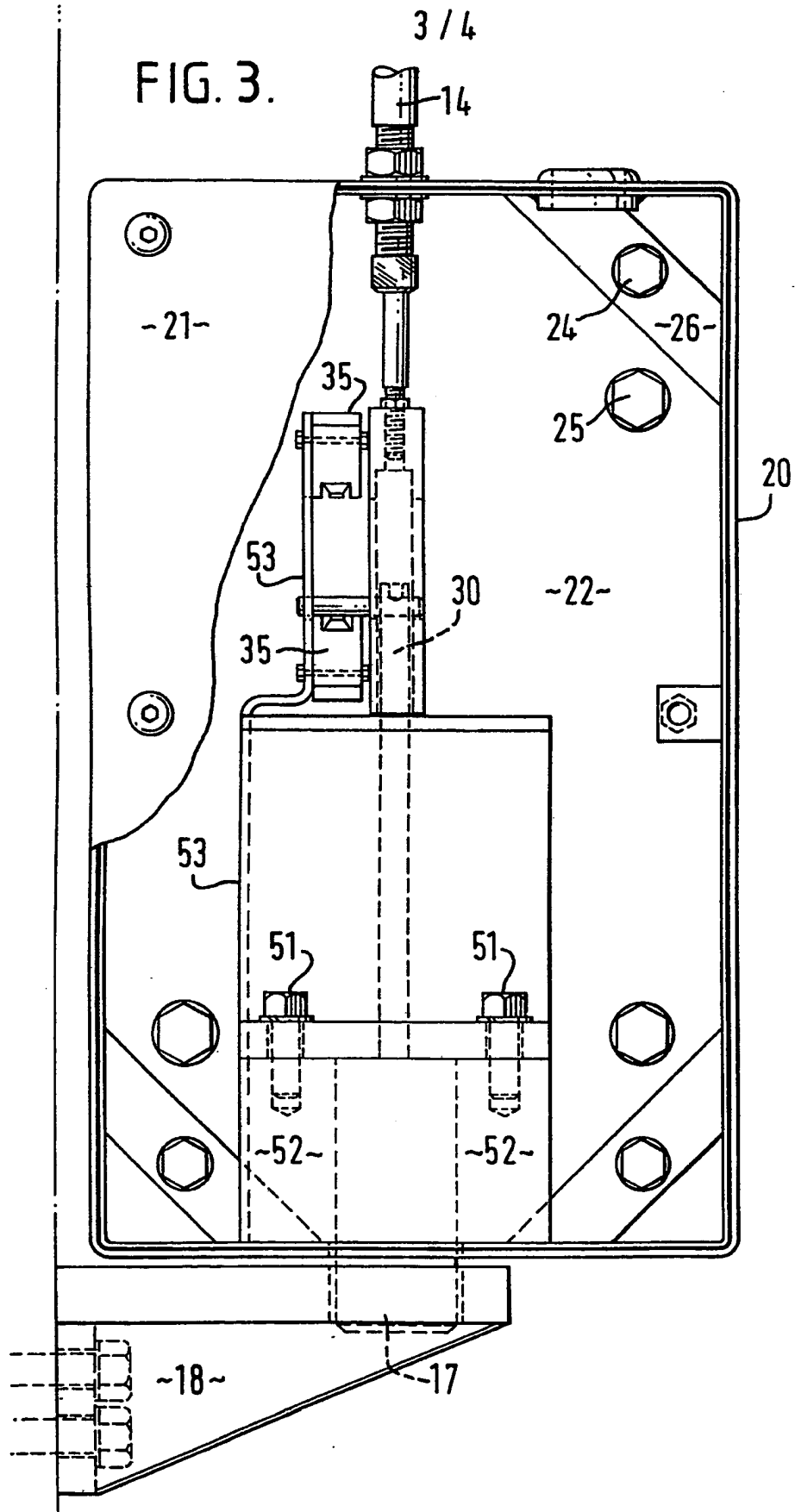


FIG. 2.



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FIG. 3.



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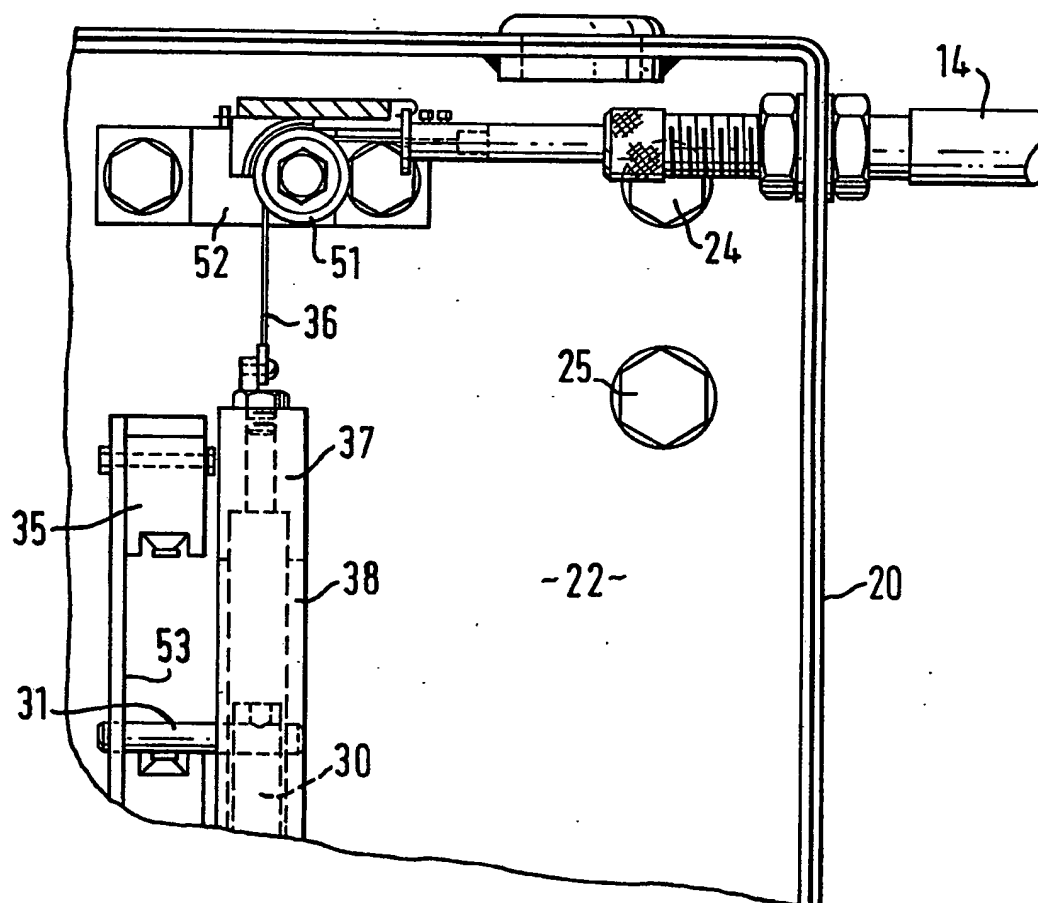


FIG. 4.

SPECIFICATION

Locks

5 The invention concerns locks, particularly but not exclusively security locks for use with heavy door and/or gates which are slidably or hingably mounted.

A number of different types of security locks are known for ensuring the security of doors and/or gates at sensitive locations—for example entrances to bank vaults or prisons. These locks are normally operable (for example with use of a key) by an operator at the lock site. This can be a severe drawback in certain circumstances;—e.g. when an operator may be powerless to resist physical threats and forced to open the gate or door.

Objects of the present invention include the provision of a lock operable from a location remote from the lock site, which lock gives to an operator at the remote location an indication of the status of the lock (whether or not the lock is locking) and which will further provide an alarm indication if any attempt is made to tamper with the lock or remove it from the position in which it is mounted.

25 According to the invention we provide a lock comprising a lock body mountable in locking relationship with a keeper or striker plate, the lock body including a lock bolt movable from wholly within the lock body to a locking position in which the lock bolt 30 partially extends from the lock body, the lock bolt when in its locking position being engageable in an aperture within the keeper plate, the lock further including control means operable from a location remote from the lock body to move the lock bolt into 35 its locking position and means for indicating, at the remote location, when the lock bolt is in its locking position.

With advantage the lock bolt is movable to a locking position by a solenoid coupled to the bolt, the control means comprising electrical circuitry within the lock 40 body and at the remote location which is operable to cause energisation of the windings of the solenoid to drive the lock bolt into the locking position.

The control means may include wired or wireless coupling extending from the remote location to the lock site.

With advantage the lock bolt is coupled directly to the solenoid thrust rod, the arrangement being such that energisation of the windings of the solenoid 50 causes movement of the thrust rod and the lock bolt. Means being provided to monitor the position of the thrust rod (and therefore of the lock bolt).

An advantageous feature of the invention provides that in addition to the above noted control means 55 there are mechanical means interconnecting the lock and the remote location by use of which an operator at the remote location may mechanically cause the lock bolt to be moved out of its locking position.

Preferably the body of the lock embodying the present invention includes means for giving an alarm 60 if the integrity of the body is breached or if an attempt is made to lift the body from the position in which it is mounted.

The above and other features of the invention will 65 become apparent from the following description of a

lock embodying the invention made with reference to the accompanying drawings, in which:—

Figure 1 illustrates schematically a security arrangement including a lock embodying the invention,

70 Figure 2 is a side elevational view of the lock of Figure 1,

Figure 3 is a front view of the lock of Figure 1, with part of a front cover plate removed, and

75 Figure 4 is a partial front view of an alternative form of the lock shown in Figure 1.

Within the security arrangement illustrated in Figure 1, and including a lock embodying the present invention, there is shown a sliding gate 10 used to shut an entrance in a wall 11. The gate 10 is locked in its 80 closed position by operation of a lock 12 from a remote location 13 (e.g. a control room). Interconnection or communication between the remote location and the lock site is provided by a mechanical linkage 14 and an electrical wired or wireless linkage 15. The lock 12 85 comprises a lock body 16 mounted on the wall 11 and housing a lock bolt 17 which is engageable (when the gate is closing the entrance in the wall) in a keeper or striker plate 18 carried on the gate 10.

The position of the lock bolt 17 is indicated at remote 90 location 13 by indicators such as lamps 19.

Figures 2 and 3 illustrate in more detail the lock 12 and show the lock body 16 to comprise a casing 20 having a front cover 21 and a back plate 22. The casing 20, front cover 21 and back plate 22 are formed of mild 95 steel or any other suitable material. The front cover 21 is bolted as shown at 23 to the casing 20 whilst the back plate 22 is secured to casing 20 by internal bolts 24. Bolts 25 pass through the back plate 22 to secure the lock body 16 to the wall 11.

100 The casing is formed with rounded corners as shown and is provided with strengthening bars 26 as indicated.

The lock bolt 17 provided within lock body 16 is movable through an aperture 27 in the bottom of the casing 20 into a locking position. When in its locking 105 position bolt 17 can enter into a slot 28 in the striker plate 18 carried on gate 10.

The aperture or slot in striker plate 18 is machined blind to eliminate the lock bolt being forced, and the 110 striker plate is mounted in gate 10 with minimum clearance between it and the lock body 16 to reduce opportunities for tampering with the keeper plate of the lock body.

The lock bolt 17 is moved by operation of a solenoid 115 29 to the thrust rod 30 of which the lock bolt is rigidly fixed. Electrical energisation of the windings of solenoid 29 causes thrust rod 30 to move and in turn move the lock bolt 17.

120 Energisation of the windings of solenoid 29 with a voltage of one polarity will move the lock bolt 17 to a locking position (that is to say move it downwardly as viewed in the Figures) whilst reversal of the polarity of the energising voltage applied to the windings of solenoid 29 will cause thrust rod 30 to move in the 125 other direction and the lock bolt to be withdrawn into the lock body 16.

The lock is powered with a 24 volt D.C. supply (although any other suitable electrical supply may be 130 used) and all power and signalling cables to and from the lock are run through a reinforced conduit 15

passing along or through the wall 11 on which the lock body 16 is mounted to the remote control location 13. This cabling is shown to pass into the lock body via the top of casing 20 in Figures 2, 3 and 4, however it will be appreciated that any entry position may be chosen to suit particular site conditions.

Thrust rod 30 extends through the solenoid winding 29 and it its other end carries a pin 31. Inductive proximity switches 35 are provided which monitor the position of the thrust rod 30 (by monitoring the position of a pin 31 attached thereto) and are used to give an indication at the remote location 13 of the position of the lock bolt 17.

In the case of component failure—or power failure—the lock is fitted with a manual override system operable from the remote location 13. This override system comprises a mechanical linkage in the form of a cable 36 entering the lock body 16 from above (as shown in Figures 1 and 2) or from one side (as shown in Figure 4), the point of entry being chosen to suit particular site conditions. The cable 36 is coupled to the solenoid thrust rod by a slider 37. Slider 37 includes a slot 38 in which the pin 31 lies. An operating lever at the remote location 13 may be used to lift the slider 37 until the pin 31 bears against the lower end of slot 38 further movement of the cable 36 will cause the thrust rod 30 to be lifted and the lock bolt to be pulled into the lock body 16. The length (and routing of cable 36) is determined to suit particular site conditions.

The free movement of the slider 37 coupling cable 36 to thrust rod 30 via the pin 31 is approximately 50 mm.

A microswitch 39 is provided within the lock body 16 mounted on the back plate 22. The toggle 40 of the microswitch 39 passes through an aperture 41 in back plate 22 to engage against the wall 10 on which the lock body is mounted. The microswitch 39 is normally biased, by the contact of its toggle 40 with wall 10, into a condition holding an alarm circuit in an OFF state. Any attempt to lift the lock body 16 away from wall 10 causes microswitch 39 to switch to its other condition and causes an alarm to be generated at the remote location 13.

Another microswitch 42 is provided within the lock body 16 mounted on the casing 20. Switch 42 is biased into one condition by the front cover 21 when that cover is properly fitted. Any attempt to remove front cover 21 releases microswitch 42 which, as with microswitch 39, is arranged to generate an alarm signal at the remote location 13.

As can be seen from Figure 1 gaskets 43 are provided between the mating surfaces of the casing 20, the front cover 21 and the back plate 22. In addition an airtight seal 44 is provided to surround the lock bolt 17 as shown. When mounting the lock the gaskets 43 and seal 44 are provided to hermetically seal the interior of the lock body 16 and to prevent possibly corrosive substances being introduced to the interior of the lock body 16.

In addition to providing an indication at the remote location 13 (lamps 19) of the position of the lock bolt 17 the lock body 16 may, optionally, be provided with a lamp 45 for indicating when the lock bolt 17 is in a locking position.

A yoke 50 is provided bolted at 51 to two posts 52

welded to the bottom wall of casing 20. Yoke 50 acts to support solenoid 29 and guide lock bolt 17 into and out of the locking position. Yoke 50 also acts as a support for plate 53 on which the switches 35 are mounted.

Figure 4 illustrates a modified form of the lock shown in Figure 1 in which the entry of cable 36 to the lock body at 60 is through one side of casing 20 rather than its top.

In this cable 36, after passing through the side wall of the casing, passes around a pulley 61 mounted a pulley stand 62 fixedly attached to the back plate 22 of the lock body 16.

When using the arrangement shown in Figure 4 it has been found desirable to provide a return spring tending to bias the lock bolt 17 away from the locking position to aid operation of the lock from the remote location. Other parts of the lock shown in Figure 4 are as described with reference to Figures 2 and 3 and will not further be described.

It will be appreciated that a number of additions and/or modifications may be made to the described arrangement without departing from the scope of the present invention.

For example it is to be noted that the gaskets 43 and seal 44 provide hermetic sealing for the lock body. Thus it is possible that when the lock body is mounted in position the interior of the casing be pressurised to a superatmospheric pressure level. In this case a pressure sensor (e.g. sensor 63) located within the lock body will generate a signal indicative of the actual pressure therein and electrical circuitry (not shown) may be provided which is arranged to generate an alarm indication at the remote location 13 should the pressure within the lock body fall thus indicating that the integrity of the lock body has been breached.

Although described above with wired connections between the lock body 16 and the remote location 13 it will be appreciated that a wireless connection may be used. In such circumstances a small R.F. signal receiver (not shown) would be provided within the lock body 16, which receiver is operable in response to receipt of a particular coded radio signal (sent thereto from a transmitter at the remote location 13) to energise the windings of solenoid 29. In such a case power to the parts of the lock within the lock body would be provided by batteries (not shown).

As described solenoid 29 is powered to drive the lock bolt 17 both into and out of its locking position. It is envisaged that the arrangement could be modified such that lock bolt 17 is normally biased into (or out of) its locking position by a large spring (not shown), solenoid 29 being energised to drive the lock bolt 17 out of (or into) its locking position only when it is required to open (or lock) gate 10. In this way de-energisation of solenoid 29 (for example during a power failure) would have the result that the lock bolt 17 automatically moves into (or out of) its locking position.

The optional indicator lamp 45 which may be provided on the front cover of the lock body 16 gives an indication to anyone at the lock site of the status of the lock. This lamp also aids installation and maintenance of the lock, however in conditions where maximum security is desired lamp 45 may (if it is provided) be disconnected after mounting so that

after mounting there is no visible indication at the lock site of the status of the lock.

The proximity switches 35 which sense (and provide an indication) of the position of lock bolt 17 may be used not only to indicate the status of the lock but also, if solenoid 29 is used to drive the lock bolt 17 to both locked and unlocked positions, to alter the polarity of the power supply to the solenoid 29. Thus an operator at the remote location 13 would merely need to operate a single push button to operate the lock.

The proximity switches 35 are, we prefer, inductive proximity switches but any sort of limit or microswitch may be utilised.

In certain circumstances the lock body 16 may be provided with controls enabling a user at the lock site to open or close gate 10 without recourse to an operator at remote location 13.

Although the lock body 16 is described as being mounted on a wall and cooperating with a striker plate on a sliding gate it will be appreciated that the lock now proposed may be used with a hinged gate or door and that the positions of the lock body and striker plates may be reversed. It will further be appreciated that the lock body and/or keeper plate may be mounted within the wall (or gate) and gate (or wall) respectively.

Although description is given of a front cover 21 which is bolted onto the casing 20 it will be appreciated that the front cover may be provided as hingably mounted door to the lock body 16 which is itself lockable in a closed position.

Although not particularly described it will be appreciated that readily available fuse or circuit breaker protection is provided for each of the electrical elements described above.

Again it will be appreciated that although the power to the lock is described as being via a 24 volt D.C. supply any other direct current supply may be utilised, or even an alternating current supply being provided with suitable rectification equipment provided within the lock body 16.

Finally it should be noted that the lock is formed of elements of substantial mass which of themselves aid the overall security of the entrance being secured with it. If the lock body, as illustrated, is placed above a sliding gate to engage a keeper or striker plate in the top of the gate then lock acts to retain the gate in its guide channel should any attempt be made to life the gate therefrom.

It will be appreciated that the above described arrangement provides a lock operable from a remote location and which provides at the remote location an indication of the status of the lock. The lock is described as being electrically operated but mechanical linkages are provided between the lock and the remote location enabling the lock to be operated when there has been a power failure.

CLAIMS

1. A lock comprising a lock body mountable in locking relationship with a keeper or striker plate, the lock body including a lock bolt movable from wholly within the lock body to a locking position in which the lock partially extends from the lock body, the lock bolt when in the locking position being engageable in an aperture within the keeper plate, the lock further

including control means operable from a location remote from the lock body to move the lock body into the locking position and means for indicating, at the remote location, when the lock is in its locking position.

2. A lock as claimed in claim 1, wherein the lock bolt is moved into a locking position by a solenoid coupled to the lock bolt, wherein said control means comprises electrical circuitry within the lock body and at the remote location operable to cause power to be fed to the windings of the solenoid so as to drive the lock bolt into a locking position.

3. A lock as claimed in claim 2, in which said control means includes a wired coupling extending from the remote location to the lock body.

4. A lock as claimed in claim 3, wherein said control means includes a R.F. receiver within the lock body, which receiver is operable in response to a particular coded signal generatable at the remote location to energise the solenoid winding to cause the lock bolt to be moved to a locking position.

5. A lock as claimed in any one of claims 2, 3 and 4, wherein the coupling between the solenoid and the lock bolt is by a direct coupling of the lock bolt to the solenoid thrust rod, the arrangement being such that energisation of the windings of the solenoid causes movement of the thrust rod and the lock bolt, and said indicating means comprising means operable to sense the position of the thrust rod and therefore of the lock bolt.

6. A lock as claimed in any of claims 1 to 5, further including mechanical means interconnecting the lock and the remote location by use of which an operator at the remote location can mechanically cause the lock bolt to move out of its locking position.

7. A lock as claimed in any of the claims 1 to 6, further including integrity checking means operable to initiate an alarm at the remote location if the integrity of the lock body is breached, or if the lock body is lifted from its mounting position.

8. A lock as claimed in claim 7, wherein said integrity checking means includes electrical switches biased into a first condition by the fixture of the front cover onto the lock body, and by the mounting of the lock body in its mounting position, removal of the front cover, or of the lock body from its mounting position, causing said switches to move to their other conditions and generate an alarm indicating signal.

9. A lock as claimed in claim 7 or claim 8, wherein the lock body is hermetically sealed and, at installation, is pressurised, a pressure sensor being provided within the lock body which is operable to provide an alarm indication should the pressure therein fall.

10. A lock substantially as hereinbefore described with reference to the accompanying drawings.

11. A security arrangement including a lock as claimed in any of claims 1 to 11 and as described herein.